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Creamery and dairy notes

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CREAMERY AND DAIRY NOTES.

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I. Sweet Cream Butter. Keeping Quality.

In Bulletin No. 8 was recounted an experiment in sweet cream butter-making which was carried out at the creamery of Mr. J. M. Daniels, Dayton, Iowa, on the 14th of December last.

Two tubs of sweet cream butter were made. One of these and a tub of ripened cream butter made the same day were brought to Ames for storage and to be compared as regards keeping quality. For the remainder of the winter and until about June 20th they were stored in a cellar, without ice, and examined once a month or oftener, with aid of a trier. When the weather became so warm that the butter was softened throughout, they were placed in an ice chest and there kept for nearly two months, when the trial was brought to a close, August 20th.

Result.

The opinions of a number of persons, some of them experienced as butter judges, were obtained at intervals during the progress of the trial. These opinions usually agreed, and were in substance as follows:

For the first three or four months from date of churning, both remained perfectly sweet.

At the end of five months (temperature of cellar being then 66° F; earlier it had been as low as 46°) it was decided that the ripened cream butter showed signs of deterioration.

At the end of six months several judges agreed that the sweet cream butter was in the better condition—that it had suffered less from age than the ripened cream product.

Soon after this the warm weather softened both throughout. They stood in this condition two weeks, deteriorating much, naturally.

After hardening up on ice, seven and one-half to eight months after churning, while both were rather "strong" the ripened cream sample was the "stronger" of the two.

Summing up:

There was no very marked difference in the keeping quality of the two butters; what difference there was, was in favor of the sweet cream product.

As to *flavor*, for the first two or three months most of the tasters preferred the ripened cream butter, declaring that made from sweet cream to be comparatively "flat", "insipid" or "flavorless;" but the longer the butters were kept, even while both were still sweet, the less marked became the difference between them in this respect.

In closing I wish to record my appreciation of the aid rendered in this experiment by Mr. J. M. Daniels, without whose co-operation it could not well have been made.

II. The Composite-Sample. Preservatives for Keeping Milk-Samples for Testing.

In Bulletin No. 9, article headed "The Relative Value Plan," a method was proposed for enabling separator creameries to determine the butter value of all the milk purchased by them, while avoiding at least five-sixths of the work and expense for chemicals that would be required in testing daily each patron's milk.

For details of the plan the reader is referred to the bulletin just mentioned. Let it suffice here to say that the plan consists in taking a sample every day from each patron's milk, accumulating the samples for a week, keeping them sweet and unchanged by means of a suitable preservative, and at the end of the week testing the "composite sample" once for all, to ascertain the mean butter value of *all* the milk delivered by the patron during that week. By this plan it is only necessary to make sixteen or seventeen tests daily in order to keep up the *complete* valuation of *all the milk delivered* by one hundred patrons.

The only difficulty in the matter is to find a preservative in all respects suited to the purpose. A powder is preferable to a liquid, as explained in Bulletin No. 9; and in that bulletin, page 365, was given the formula for a powder which by many trials had been proved to be entirely successful during spring and winter months.

The active agent in it is corrosive sublimate (bichloride of mercury or mercuric chloride) a very violent poison when taken internally. The formula calls for an aniline color, which warns of danger by imparting to the preserved milk a

bright pink or scarlet color. Notwithstanding this, the poisonous quality of the powder was considered objectionable, and further experiments were promised in the hope of finding a substitute free from this dangerous property. Further trials were also promised to ascertain if this mercury preservative would be efficient in the hottest part of summer—the earlier experiments having been made during the winter and spring months.

To touch the latter point first, trials have been made with the samples exposed not only to the natural heat of summer, but also to the heat of a green-house where the temperature for hours each day often ranged from 120° to 130° F. In all cases the preservation was perfect for the desired length of time, as shown by tests of the milk at the beginning and end of the trials. Numerical results in proof of this are at hand, but it is needless to give them.

Another fact was learned, namely, that very much less of the preservative is required than was used in the experiments of Bulletin No. 9. One fourth or one fifth as much appears to answer quite as well. The discovery of this fact led to attempts to reduce still further the amount of mercury needful, by combining it with some other antiseptic powder.

Borax naturally suggested itself, from its cheapness. The results were gratifying, and after a number of trials with different proportions the following mixture was settled upon as being efficient and inexpensive:

Mercuric Chloride, by weight	10 parts.
Aniline Rose Pink, 3 B, by weight	1 part.
Powdered Borax, by weight	50 parts.

The two first named ingredients are well mixed together, and then thoroughly incorporated with the borax by rubbing in a mortar. It must be labelled POISON.

In ordinary weather ten grains of this is sufficient for the average sized composite sample accumulated during a week. (See Bulletin No. 9). One pound then will do the work for 700 patrons one week, or for 100 patrons seven weeks. As the cost of one pound of the powder should not exceed seventy cents, the expense per patron per week would be about one mill.

Notwithstanding the fact that the amount of corrosive sublimate used in each composite sample is thus reduced to two grains or less, the precautions mentioned on page 362 of Bulletin No. 9 should be scrupulously observed by everyone who may use this powder.

Coming now to the other point, viz., the attempt to obviate entirely the use of mercury, my experiments here, while very numerous and extending throughout the entire past summer, I cannot regard as conclusive.

[True, I have found two agents which preserve milk perfectly, and in excellent mechanical condition, for the desired length of time. They are

(1.) AMYLIC ALCOHOL (*Fusel Oil*)

(3 per cent by volume in the milk), and

(2.) SODIUM FLUORIDE,

(40 to 60 grains to 200 c. c. of milk).

But of these two one has a known, the other a probable fault. Fusel oil cannot be used because in testing it reappears united with the milk-fat, thus enlarging the true result. The probable fault with the sodium fluoride is that it may cause corrosion of the measuring part of the glass testing-tubes or bottles, gradually enlarging their caliber and thus rendering readings too low. I say "may" because it is not yet demonstrated to be so. Pressure of other work has to date prevented thorough investigation of this point.]

III. THE IOWA STATION MILK TEST, NEW FORM, SUITABLE FOR CREAMERIES. THE BRINE BATH METHOD.

The milk-test bearing the name of this Station, as originally devised, and described in Bulletin No. 8, was intended especially for use of farmers, breeders and dairymen, as an easy means of testing their individual cows and "weeding out" their herds.

While the Test has been used by these classes and for this purpose to a limited extent, it early became evident that those most interested in it and most intensely desirous of finding a milk-test especially adapted to their needs, were the separator creamery men; for from the very first they have used this test to a much greater extent than have the classes for whom it was especially designed. But it was not intended for use in creameries. The heat used was that of a kitchen stove such as every farmer has, or of a gasoline stove. Such appliances are inconvenient in a creamery. There the most convenient source of heat is steam. Therefore it was resolved to adapt the Test to the application of steam heat. A few months ago this was accomplished by the very simple means of replacing the sand-bath by a bath of boiling salt water, for heating the tubes. This arrangement is called the BRINE BATH form of the Test. It was first shown to the

public at the Iowa State Fair (at Des Moines, August 28th to September 5th, 1890,) where it was kept in almost constant operation throughout each day, and where it was used by the judges in the Prize Dairy Contest for determining the butter value of the milk given by the several cows entered.

Description.—The brine-bath consists of a tank lined with zinc, or preferably lead, with steam coil in the bottom, and containing a proper amount of saturated brine (made with the cheapest grade of common salt), with some excess of salt undissolved in the bottom. The depth of the brine is such that it will reach above the top of the charge in the milk tubes when they are set in, and during the entire boiling. A stout wire support keeps the tubes from contact with the steam pipes.

The racks have a coarse wire gauze at bottom, to support the tubes.

The tubes are the same as those used in the original form of the Test, but do not have the copper rings..

The Acid Mixture is different. Its formula is as follows:

Pure Acetic Acid of 90 percent strength.....9 volumes.
Oil of Vitriol, sp. gr. 1.83.....5 to 6 volumes.
Mix, allow to cool, and add to the mixture about two percent by volume (= barely 1.2 percent by weight) of rectified methylic alcohol (Wood Spirit.)

Operation.—The tubes are charged as for the sand-bath, with the following exceptions and precaution: (1). Have all the milk and acid that are in body of tube thoroughly mixed.

(2). Have the entire charge reach only to top of neck (instead of ¾ inch above); this is mainly, but not wholly, to economize acid.

(3). In testing preserved milk, i. e. the "composite sample," throw into the tube, on top of the charge as described above, 2 or 3 c. c. (about a thimble full) of anhydrous sulphate of soda.

Have the brine bath fully saturated with salt *when boiling*, as evinced by the whiteness of the liquid, caused by floating salt. Keep the bath actively boiling while the tubes are in.

When a dozen tubes are charged and placed in the rack, set them into warm water (140° F. will do) for a minute, to prevent breakage. Then place them in the boiling brine, and note the time. While these are boiling a second set of twelve tubes can be charged, and possibly a third. When the second rack is filled, it is placed in the boiling brine beside the first, with the same precaution as before to avoid breakage, and the time is noted.

With fresh milk twenty-five minutes in the bath is sufficient; with the "composite sample" thirty minutes are usually required. When the time has elapsed for a rack-full of tubes, it is removed from the brine and placed in a pail of water, at 140° F., or thereabouts.

After four or five minutes the fat is lowered, and after ten or twelve minutes all told in the water, it is measured. In lowering the fat, the pin is best dispensed with.

By this method if three dozen or more tests are to be made at once, the operator's time is spent almost entirely in the acts of charging tubes and reading results.

As time is by far the most costly item in any accurate method of testing milk yet devised, this economy of the operator's time is regarded as one of the chief merits of the Brine Bath method.

This method allows also of testing each patron's "composite sample" before his own eyes, and with very little labor, as a single tube can be set into the boiling brine at any time, the bath being kept in readiness during the hours when patrons are delivering their milk.

Graduated vs. Ungraduated Tubes.—As stated in Bulletin No 8, the greatest difficulty is met in obtaining from the makers tubes with accurate graduations. Among the tubes tested in this laboratory during the part year, quite a number were found with an error of .4 to .5 per cent, on the entire scale of 8 per cent—that is, an error of one-quarter pound of butter-fat per 100 lbs of 4 per cent milk; and in one case the error was double that. A large number of tubes have been found perfect, but these comprise only a small part of the entire number tested; by far the larger part have had errors ranging from .1 to .3 per cent, large or small. These errors have been minimized for comparative purposes, by selecting those of like errors + or — to go together in the same set. But so doing does not remove the fact that tubes with a + error (*i. e.*, too large) differ from those having a — error of the same magnitude (*i. e.*, too small), by just *double* the absolute error of each.

From these facts it is plain that the *graduated* tube, even when the greatest precautions are taken to secure accuracy, is in practice not up to the desired standard. Do the best we can, plenty of unavoidable errors will creep into the testing and valuing of milk—in taking the sample, in measuring the charge for test, in the test itself, and in the *act* of reading or measuring the resulting fat—without tolerating a *known* and *avoidable* error, even though it be small. There-

fore I very much favor the *un*-graduated tube, calibrated by a careful and responsible person, and indelibly marked with a number expressing its caliber or its cubical contents per a given length; the actual measuring of fat to be done with a millimeter rule, and the percentage to be found by reference to a table giving percentage results for *all possible* "readings in millimeters," in tubes of *all possible* calibers, within limits. Such tubes have been calibrated under my supervision for the past six months.

IV. Losses of Fat in Buttermilk.

In the course of experiments made last winter at Mr. J. M. Daniels' creamery, at Dayton, Iowa, (experiments reported in Bulletin No. 8), analyses were made of four samples of buttermilk, from churnings on four different days. The cream was obtained with a De Laval turbine separator; it was ripened to the usual degree of acidity, and churned in the ordinary box churn. Analyses by gravimetric method.

Results:

SAMPLES	1	2	3	4
Percentage of fat found	.56	.82	.55	.47
Mean			.60 per cent.	

This average would be only .10 per cent on the original whole milk, and from 1.8 to 2.4 per cent on the usual butter yield.

In other words, these analyses indicate a loss of butter (butter fat) in churning, which in general practice would amount to 1 lb. for every 1000 lbs. of whole milk, or 18 to 24 lbs. for every 1000 lbs. of butter obtained.

[This assumes the cream to be one-fifth of the weight of the milk, and the butter obtained to be one-fourth to one-fifth of the weight of the cream.]

A more extended study of the subject was made the same winter, by analysis of buttermilks from the cream-gathering creamery of C. W. Sibley & Co., State Center, Iowa. The samples were taken by Mr. Sibley himself, and expressed to Ames.

The following notes from my laboratory book explain themselves. All analyses were made by the gravimetric method.

Nov. 26, 1889. Eight samples buttermilk from Sibley & Co. Samples nearly a week old (from date of churning) when received.

Description:

Samples 1, 2, 3 and 4 are from cream held one day after gathering.

Samples 5, 6, 7 and 8 are from cream held two days after gathering.

All are from separate churnings.

Results:

SAMPLES.....	1	2	3	4	5	6	7	8
Per cent. fat found	.46	.36	.40	.31	.32	.45	.38	.33
Mean.....	.38 per cent.				Mean.....	.37 per cent.		

These results would probably all have been a trifle higher (.05 to .10) had the samples been fresh from the churn.

The loss of butter-fat is seen to have been practically the the same whether the cream was held one day, or two, after gathering; showing it to have been sufficiently ripened for economical churning, at the end of the first day.

Dec. 4. Four samples buttermilk from Sibley & Co., from four different churnings. Samples analyzed next day after churning.

Results:

SAMPLES.....	1	2	3	4
Per cent. fat found.....	.62	.68	.54	.50
Mean.....			.58 per cent.	

[To test the influence of age of sample upon the analytical results, samples 3 and 4 were kept in the laboratory (in tubes well corked) for ten days, and then analyzed again. Results, respectively, .40 and .43 per cent; showing a mean falling off of .10 per cent.]

Dec. 16. Two samples buttermilk from Sibley & Co.; from two churnings on the 14th.

Results:

.47 and .56 per cent. fat.
Mean .51.

Feb. 21, 1890. Two samples buttermilk from Sibley & Co., described thus:

Sample 1, from churning of sweet cream.

Sample 2, from churning of acid cream.

Results:

	No. 1	No. 2
Per cent. fat found	.73	.67

Both results were higher than usual; bnt the difference between them was surprisingly small, considering they were from sweet and acid cream respectively.

Finally, the average of all the results—16 in number—on buttermilks from the creamery of Sibley & Co. is .49 per cent,—in round numbers one-half a pound of butter-fat per 100 pounds of buttermilk. This, in general practice, would be a loss of a trifle less than 1 lb. of butter fat for every 1000 lbs. of whole milk, or of 15 to 20 lbs. for every 1000 lbs. of butter made.